

CNC Router Provides 400% Productivity Gain for Woodworking Manufacturer

Switching from conventional power tools to a CNC router helped a manufacturer of gun safes increase productivity by 400%. When Champion Safes used power tools to produce racks for its gun cases, each person could only produce enough parts for 20 to 30 safes per day. To increase productivity, the company invested in a computerized numerical control (CNC) router that works unattended to produce parts of any shape, simple or complex, based on a computer program. Now a single person can produce all the parts needed for 120 safes in one day. Quality has been substantially improved because the CNC router doesn't make mistakes and cuts to an accuracy of 0.002 inch compared to typical 1/16 accuracy for manual cutting. "We have substantially reduced our manufacturing costs while increasing our quality," said Terry Zierenberg, Director of Engineering for Champion Safes, Provo, Utah. "What's really amazing is that the CNC router that does all this costs only \$15,000."

Champion Safes has been building heavy and tough safes since 1998. The company's safes sell for between \$800 and \$2,500. Champion Safe bodies are pressure-formed from thick A-36 carbon steel plate with fully welded top and bottom caps. Doors are built out of heavy A-36 carbon steel plate with sandwiched fire insulation, offering more security and better fire protection than a plate steel door alone. Champion uses heavy-duty, ball bearing internal hinges and multiple relockers that collectively protect a safe against drilling and forced entry. Champion Safe is the only home security safe company to use a glass, bank-vault type relocker. To protect the lock from attack, it bonds

industrial diamonds to tungsten steel hardplate. The company includes fire protection, standard on all models, ranging from 30 minutes at 1200°F to 105 minutes at 1550°F for different models.



Previous manual machining methods

The notched racks that hold the guns inside the safe are cut out of three-quarter inch particleboard. The geometry of the racks is complex because each rack typically holds 20 to 30 guns. In the past, skilled woodworkers cut these racks using hand routers with bearing bits by following templates, and with table saws. The accuracy of the racks depended on the accuracy of the templates, and making good templates required patience and long experience. Frequently, templates were ruined and new ones had to be made before the job could continue. A skilled craftsman was needed to accurately follow the lines of the template. Even though the operator would follow the template carefully, he or she might bump corners or otherwise damage the template so that it got worn out and had to be replaced. For all these reasons, one person was only able to produce enough components for about 20 to 30

gun safes per day and five people would have been needed to handle today's production volume.

Zierenberg had long thought about purchasing a CNC machine to perform this operation but, when he originally checked, the cost of these machines put them out of reach. "When I worked for a competitive safe company, we bought a CNC router for \$65,000," he said. "Prices have dropped since then but until a couple of years ago, the cheapest machine that I could find that would do this job cost about \$45,000, which was more than we could justify," he said. "These were machines with servo-motors and ball screws that provide high levels of accuracy, and large tables that make it possible to produce big parts. We didn't want to spend that much because we only have one group of wood products, so we can only use the machine in a few areas. When I heard about Techno's LC router, which offers essentially the same features and capabilities for under \$15,000, my first question was: can it hold up? I saw a demonstration at a local dealer and it looked good so I decided that for that money it was worth the gamble."

New router offers mix of performance and economy

Techno's LC series CNC routing system provides a number of critical features that allow it to deliver accuracy and long-term reliability of a level that has previously only been available from machines at a much higher cost. Ball screws are provided on all three axes, offering smooth motion, a high level of accuracy and repeatability, and minimal maintenance. Ball screws have a number of advantages over racks.



They don't have the play or the requirement for adjustments that racks do; they also do not wear as easily as racks do and they are far less likely to get debris in the mechanism than racks to cause skipping and errant motion. A closed-loop servo control system provides constant position feedback, higher power, and smooth continuous motion that eliminates the possibility of losing position in the middle of a part. Servomotors, unlike stepper motors, do not "lose position" and cannot skip steps. Servos are also far better for 3D applications because they can change speed "on the fly" without losing power as steppers do.

Zierenberg generated programs for the gun racks and a number of other wood parts, such as center dividers, used in the company's different models of safes. He designed jigs that hold the particle board blanks in place. An operator simply loads the jig with a pre-cut blank, calls up the appropriate program, and hits the start button. He then walks away while the router finishes the part. It typically takes the Techno router about one minute for each rack that is machined. Some of the racks are more complex and take as long as four minutes. While the router is busy, the operator can work on other jobs, such as cutting out blanks on a table saw.

Automating the process of machining racks

"When we got the new process for machining racks up-and-running, I felt like I had died and gone to heaven," Zierenberg said. "The LC Series machine does everything we need it to do at a remarkably low price. As far as durability goes, I have been amazed and satisfied. We have been running



the machine all day, every day for two years and have no problems. By the way, besides being less expensive than other CNC routers, the LC also takes up quite a bit less space, which provides additional savings." The LC series machine includes a heavy steel ground stress-relieved base and an aluminum T-Slot table that can be easily converted to a vacuum table by installing the Techno vacuum table accessory kit. Because the frame is a single welded piece, there is no chance for it to get "out of square" or require alignment.

"Techno's sales team were very helpful, not only giving me all the information I requested about the machine, but also helping me find the right software package and providing me with the necessary training to get my production up-and-running quickly," Zierenberg added. The machine comes fully assembled and includes Techno's Windows-based CNC G-Code interface with free lifetime software upgrades.

The machine is available in three sizes, with work envelopes of 30 by 24 inches, 50 by 48 inches and 50 by 96 inches. Each of these models provides a repeatability of 0.001 inches, a resolution of 0.0002 inches and a maximum speed of 250 inches per minute. A wide range of optional equipment is offered including a laser scanning module, CNC lathe attachment, Porter Cable router, vacuum blower, and fourth axis rotary table. The 4-foot by 8-foot model sells for \$13,995.

Higher productivity means increased profits

The increase in productivity that has been achieved with the new machine has significantly reduced Champion's manufacturing costs. "Clearly, the availability of high-quality, low-cost routers has the potential to dramatically improve the profitability of every manufacturer that uses wood in their product," Zierenberg said. "Our savings extend through the assembly process as well because the more accurate parts that we produce with the new CNC router avoid the need for manual fitting. Having lower manufacturing costs than our competitors gives us the opportunity to offer greater value to customers and increases our sales volume. Higher productivity means that we are able to handle this volume without adding workers, which increases profit margins. Techno's LC series CNC is clearly the wave of the future for woodworking manufacturing."